

March 27, 2003

US Department of Transportation
Docket Management System
Docket No. FAA-2003-14449
Room PL 401
400 Seventh Street SW
Washington, DC 20590-0001

Subject: Comments to Docket FAA-2003-14449, Notice of Proposed Rulemaking (NPRM), Notice No. 03-03, "Enhanced Flight Vision Systems"

Reference: NPRM published in the Federal Register on February 10, 2003 (68 FR 6802)

Dear Sir or Madam:

Boeing Commercial Airplanes recognizes that the goal and intent of the subject NPRM -- to update obsolete provisions of current rules and provide technological incentives, where fair and valid -- has merit. For example, Enhanced Vision Systems (EVS) can potentially provide improved pilot "situation awareness" and afford protection to aircraft from hazards such as aircraft or vehicle collision during night operations on the airport surface. However, we consider that this particular NPRM has serious conceptual flaws and its proposed requirement could potentially lead to adverse technology evolution and safety effects. We request that FAA not issue a final rule without major revisions to the proposed text.

Because of the serious nature of the concerns with the current wording of the NPRM, we suggest that any subsequent revisions to the NPRM be coordinated through both the FAA-sponsored All-Weather Operations Harmonization (AWO) and FA Terminal Area Operations Review (TAOARC) processes. Any revisions also should be consistent with other recently issued related NPRMs issued, such as:

- Docket No. FAA-2002-14002, NPRM Notice No. 03-04, "Reduced Vertical Separation Minimum (RVSM) in Domestic United States Airspace" (68 FR 9818, February 28, 2003); and
- Docket FAA-2003-14305, NPRM, SFAR 97, "Special Operating Rules for the Conduct of Instrument Flight Rules (IFR) Area Navigation (RNAV) Operations Using Global Positioning Systems (GPS) in Alaska" (68 FR 3778, January 4, 2003).

This NPRM appears to be inappropriately written to favor one or a few specific technologies or methods, to the exclusion of other potentially better and more efficient methods. The NPRM is not technically sound, and could temporarily shift investment of segments of the aviation community toward inferior technical -- and potentially risky -- directions, without sufficient operational or safety experience.

Examples of the critical areas of concern we identified in this NPRM are as follows.

- 1) The NPRM's provisions are inconsistent with movement toward a performance-based International Airspace System (INAS). They also are inconsistent with applications of Required Navigation Performance (RNP) (e.g., the NPRM addresses only specific limited technologies, such as EVS; it does not credit other more capable technologies).
- 2) The NPRM sets precedents with regard to inappropriate definitions and concepts that are inconsistent with, and adversely interfere with, necessary "global" navigation systems evolution [e.g., approach procedure with vertical guidance (APV); EFVS; incorrect and inappropriate conceptual use of approach categories such as Category I, II, and III].
- 3) The NPRM could inappropriately set a precedent in rulemaking, inferring that this type of regulation is needed to implement new technology, when it is not. New technology applications -- such as Cat I, II, III, RNP, head-up display (HUD), ILM EVS use in 14 CFR Part 121, and others -- were successfully implemented without such a rule change. Current difficulties in technology application can, in many instances, be traced back to inappropriate policies or incorrect application of current rules, rather than to lack of appropriate rules. While minor updating of rules for obsolete provisions would certainly be appropriate, it is incorrect to assume that current rules are significantly inhibiting any valid technical advances. Instead, inhibiting factors for application of new technology appear to be far more commonly related to the incorrect or inappropriate application of current rules or policies, than to any deficiencies in the rules themselves.
- 4) The language of the NPRM is technically flawed in that it makes assertions such as, "... *EVS encompasses most or all important emerging technologies ...*," when in fact, the performance of other systems may far exceed that of EVS in terms of both good performance and low cost.
- 5) The NPRM appears to exclusively attempt to credit systems meeting criteria only related to one form of EVS (that is, HUD). This is not appropriate technically because certain characteristics of those types of systems can be contrary to the general direction approach-and-landing needs to evolve in an xLS, Global Navigation Satellite System (GNSS), Ground-Based Anti-Satellite (GBAS), and RNP-based global system.
- 6) Application of any of the proposed NPRM requirements to operators operating under Part 121, 129, or 135 is most inappropriate at this time (particularly for international operators flying in U.S. airspace).

- 7) This NPRM is not consistent not only with some key FAA guidance criteria (notably Advisory Circular 120-29A, "Criteria for Approval of Category I and Category II Weather Minima for Approach"), but also with the direction that key large aircraft manufacturers and operators are evolving future navigation systems or operational capability (as discussed in TAOARC and AWO working groups). If adopted without significant change, any final rule based on this current NPRM could unnecessarily restrict and inhibit the beneficial and necessary evolution of GNSS and RNP-related systems and applications.
- 8) Numerous areas of analysis in the NPRM's preamble are also inappropriate, incorrect, or misleading. Significant revision of the preamble is also needed before any final rule is issued.

The specific actions that we recommend the FAA to take with respect to this NPRM are:

1. Do not issue a final rule based on the present content of this NPRM.
2. Delegate the editing of this NPRM to both the AWO and TAOARC working groups, so that an amended NPRM may be issued that will incorporate and integrate provisions of this NPRM and the previously issued RNAV and Alaska GNSS NPRMs. Extend any comment deadlines and compliance proposals to a mutually consistent milestone timeline that accommodates this necessary integration.
3. Ensure that any revised or amended NPRM is consistent with evolving provisions for international harmonization and GLS, RNP, and a "performance-based INAS."

We have provided more detailed comments in three enclosures to this letter:

- **Enclosure 1:** Comment summary and general comments
- **Enclosure 2:** Detailed comments and recommendations; including recommended text for issuing an amended NPRM; and
- **Enclosure 3:** Recommended revised provisions for 14 CFR §91.175

Please direct any comments or questions to Ms. Jill DeMarco of this office at (425) 965-2015.

Sincerely,

(signed copy on file)

Captain Chet Ekstrand
Vice President, Operational Regulatory Affairs
Boeing Commercial Airplanes

Enclosures

ENCLOSURE 1

Boeing Commercial Airplanes Comments on Docket FAA-2003-14449, NPRM Notice No. 03-03, “Enhanced Flight Vision Systems”

SUMMARY AND GENERAL COMMENTS

Comment Summary

- **The NPRM is seriously flawed from both a technical and safety perspective. The rule should not be adopted as proposed.** While the general idea of a issuing a rule to address new technology has merit, this proposal, as written, has serious deficiencies from technical, regulatory, economic, and safety perspectives. It should not be adopted.
- **The NPRM is not performance based; it is inappropriately technology- and method-specific.** The NPRM is much too specific and narrowly defined to serve as a rule of general application. Even if adopted, it would likely be soon outdated, because it is presented in a technology-specific form, rather than in a performance goal form. It only recognizes specific, limited technology approaches and methods and, thus, unfairly limits utility or credit to only one specific solution. Many other methods could be at least as good as or could offer better operational performance at less cost. The proposed rule should be rewritten as a simplified "performance-based" rule (see ENCLOSURE 3). A performance-based rule would more fairly support, recognize, and give credit to alternative or superior methods. Further, the proposed rule has aspects that are unsound, contains numerous inconsistencies, leaves important issues not addressed, and has definitional problems.
- **The NPRM, as written, is not supported by key U.S. and European stakeholders.** As evident in the discussion of this NPRM at the recent FAA-sponsored All Weather Operations (AWO) Harmonization Meeting (Brussels Belgium, March 10-13, 2003), the NPRM does not appear to be supported by significant U.S. and European stakeholders as well as other non-U.S. aviation authorities [i.e., the Joint Airworthiness Authority (JAA)]. The FAA should issue only harmonized requirements with at least a basic level of European and JAA support. It will be nearly impossible to reconcile either airworthiness certification or operational regulation and use of systems designed and installed in accordance with this proposed rule. Expensive and capable systems may not be able to derive benefit, and inferior systems, which nonetheless appear to meet the proposed rules, may receive unjustified credit even while unsafe.
- **The proposed requirements of the NPRM pose safety concerns.** Representatives of European authorities, and others, correctly identify the fact that some of the proposed operations with the above systems are in fact, and should be appropriately classified and recognized as, Category II and Category III Operations. Yet the proposed Enhanced Flight Vision systems do not appear to come close to meeting the path performance standards necessary for safety for such operations

(see AC 120-28D, "Criteria for Approval of Category III Weather Minima for Takeoff, Landing, and Rollout"). The NPRM cites no evidence that adequate flight path performance can be demonstrated with imaging systems alone, whether TV, imaging radar (IR), or radar based. In fact, current operating history with such systems in R&D programs and military operations indicates the opposite conclusion, which is why such operations often rely on use of autoland. Further, there is no evidence presented in the NPRM that the "aircraft state or guidance elements" cited can perform to the levels necessary for either Category II or III, and particularly not for operations below 100 ft. HAT, flare, and rollout, or for missed approach, where such EVS systems are likely to lead a pilot without guidance assistance.

- **The NPRM provides incomplete proof-of-concept.** Operational experience and validity or utility of the concept of minima credit for EVS has not been established. The small number of procedures flown and results to date do not appear to technically establish or confirm either the safety or utility of a generalized INAS wide minima adjustment credit for EVS.
- **Additional guidance material is needed.** There is a need to develop associated guidance material, consistent with operational experience obtained without having authorized credit, before entertaining additional authorization of credit for EVS system use.
- **The NPRM should support other better and safer means that are available.** Other lower-risk means are available for the FAA to support manufacturers and operators acquiring operating experience with these kinds of systems (EVS). For example, FAA could authorize operations to a decision altitude (height) [DA(H)] of 100 ft. HAT using appropriate ILS, autopilots, or flight directors on certain U.S. Type I, II, or III ILS, with EVS use being incidental to the operation, rather than as serving as the basis for the operation [see current 14 CFR §61.3(h) for Category A aircraft]. This type of authorization could be for any category of aircraft, rather than only for Category A aircraft.

General Comments:

EVS (IR or radar systems, to varying degrees) can potentially play a useful future role for improving pilot situation awareness of nearby traffic or objects in airport surface operations, takeoff, approach, or landing, or for en route weather or turbulence avoidance.

EVS's future role for "economic" takeoff or landing minima credit is unclear at best, if not doubtful. IR systems are inherently limited in their ability to penetrate cloud (e.g., fog). There have been few, if any, credible assessments showing anything but adverse economics for using radar-based systems to provide useful advantage, as compared to other more effective and lower cost alternative technologies for low visibility takeoff and landing (such as ILS, GPS, RNP, or GBAS).

Regardless, current regulations are not the significant inhibiting factor in advancing technology. For example, Cat III, RNP, HUD, and even EVS systems have already

been successfully developed and approved, in instances even for air carrier operations (e.g., ILM). If proposed for additional uses or applications, EVS needs to be shown to be safe, effective, and reliable during use, and meet performance standards equal to or better than existing approved systems. If necessary, this can be done well within the existing regulatory structure (authority policies or advisory material may warrant updating, however). If takeoff and landing minima rules are changed at all, those changes should address areas or subjects that are out of date (e.g., obsolete basic takeoff minima constraints) or incorrect (e.g., no longer valid terminology for DH), or to additionally provide for generic technology advances (e.g., via additional provisions that are appropriately keyed to performance objectives, rather than inappropriately keyed to specific technologies, solutions, or methods).

Changes need only be made to 14 CFR §91.175 (see our recommended rewrite in ENCLOSURE 3). Changes are not needed to 14 CFR Parts 1, 121, 125, 129 or 135, since the revised provisions of §91.175 can apply to Parts 121, 125, and 135, as needed, and Operations Specifications can be used to address Part 129.

ENCLOSURE 2

Boeing Commercial Airplanes Comments on Docket FAA-2003-14449, NPRM Notice No. 03-03, “Enhanced Flight Vision Systems”

DETAILED COMMENTS AND RECOMMENDATIONS; RECOMMENDED TEXT FOR REISSUING DOCUMENT AS AN AMENDED NPRM

Our recommended changes to the text of the NPRM, and associated rationale, are shown in <i>BOLD ITALIC</i> .

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

~~14 CFR Parts 1, 91, 121, 125, and 135~~—**14 CFR Part 91**

[Rationale: Changes need only be made to §91.175. Changes are not needed to Parts 1, 121, 125, 129 or 135, since the revised provisions of §91.175 can apply to Parts 121, 125, and 135 as needed, and Operations-Specifications can be used to address Part 129.]

[Docket No. FAA-2003-14449; Notice No. 03-03]

RIN 2120-AH78

~~Enhanced Flight Vision Systems~~—***Revised Provisions for Takeoff and Landing in Low Visibility***

[Rationale: This NPRM should not be addressed separately from the previously issued RNAV NPRM or the Alaska GNSS NPRM. The three NPRMs are related in substance. All essentially address rule adjustments needed to address obsolete current provisions or technology advances. The three NPRMs should be combined into one revised and reissued proposal, as an integrated package, as recommended in ENCLOSURE 3 to these comments. The revised and reissued proposal should be titled: "Takeoff and Landing Weather Minima; Proposed Revisions"]

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of proposed rulemaking (NPRM).

SUMMARY: The FAA is proposing to revise its regulations for takeoff and landing under instrument flight rules (IFR) to ***update certain obsolete provisions and to explicitly allow additional*** for the use of ~~FAA-certified enhanced flight vision~~ ***new technology systems and capabilities*** (EFVS) that would enable the pilot to meet enhanced flight visibility ***to meet takeoff and landing minima*** requirements. The action would allow the use of new technology ***While the current rule provides for such authorizations by means of approval by the administrator, and through issuance of operations specifications, this NPRM directly addresses and additional means by which new systems may be authorized if they meet a performance standard equivalent to or better than existing approved systems.*** This NPRM also contains proposed EFVS-related changes to the ***supersedes in its entirety*** FAA's previously published Area Navigation (RNAV) NPRM, which was published on December 17, 2002, ***and the NPRM published regarding GPS operations in the State of Alaska [Federal Docket No. FAA-2003-14305, NPRM 14 CFR Parts 71, et al. Special Operating Rules for the Conduct of Instrument Flight Rules (IFR) Area Navigation (RNAV) Operations Using Global Positioning Systems (GPS) in Alaska; Proposed Rule].***

DATES: Send your comments on or before ~~March 27,~~ ***[suggested date] July 31,*** 2003.

FOR FURTHER INFORMATION CONTACT: Les Smith, Flight Technologies and Procedures Division, Flight Standards Service, AFS-400, Federal Aviation Administration, 800 Independence Ave. SW., Washington, DC 20591; telephone: (202) 385-4586.

SUPPLEMENTARY INFORMATION:

Comments Invited

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List of Abbreviations Used in This Document

~~APV—Approach procedure with vertical guidance~~
~~ASR—Airport surveillance radar~~
~~DA—Decision altitude~~
~~DH—Decision height~~
~~EFVS—Enhanced flight vision system~~
~~HUD—Head-up display~~
~~IFR—Instrument flight rules~~
~~ILS—Instrument landing system~~
~~MDA—Minimum descent altitude~~
~~PAR—Precision approach radar~~
~~RNAV—Area navigation~~

[Rationale: The list of acronyms, above, is inconsistent (e.g., ILS is widely known and is in the current rule; GLS is missing; MLS is missing; EFVS is not agreed to or adequately defined, is inappropriate, and is not needed.). The list should be either deleted or corrected and expanded.]

Background

Section 91.175 of 14 CFR prescribes flight visibility requirements when operating under instrument flight rules (IFR). ~~using natural vision~~ **[Rationale: "Natural Vision" is an inappropriate and inadequately defined term and should not be used in this context; (e.g., "natural" vision as opposed to "unnatural" vision?, "supernatural vision"? Why would visual references in the IR or mm wave part of the spectrum be any more or less natural if translated to optical frequencies?)]**

Section 91.175 also identifies, to identify the specific visual reference requirements for continuation of an approach below DA(H) or MDA(H) such as maintaining contact with approach lights, runway markings, or other features associated with the and runway environment. These procedures successful provisions were developed, used, and improved over the years many decades to provide for a high level of safety when operating an aircraft during reduced visibility conditions. however the Additionally, current rules on related to instrument approach procedures implicitly do not allow (e.g., by Administrator authorizations under FAR 91.175a or provisions such as FAR 121.567 Operations Specifications) for the use of new technologies such as enhanced flight vision systems (EFVS) RNP, certain forms of GPS-related augmentation, or visual reference enhancing sensors, but do not directly address any specific performance standard for such authorizations.

Accordingly, this rule updates certain outdated provisions, and provides a basis for approval of future system or capabilities that can be shown to provide equivalent or better performance that currently acceptable systems or procedures.

[Rationale: The following NPRM text was inaccurate, incorrect, inappropriate, or confusing, and a re-write, as follows, is recommended.]

~~which use imaging sensor technology that provides a real time image of the external topography, or synthetic vision systems, which uses a database computer generated image of the external topography. Nor do the present rules define new terms such as "enhanced flight visibility" or "synthetic vision" as they relate to flight operations.~~

~~EFVS As mentioned above, an EFVS uses imaging sensor technologies that provide a real-time visual image of the external scene topography. During some reduced visibility conditions, an EFVS can display imagery that may significantly improve the pilot's capability to detect objects, such as approach lights and visual references of the runway environment, that may not otherwise be visible. Examples of candidates systems or technologies that could be facilitated by adoption of this rule include:~~

- **GNSS based systems (Global Navigation Satellite Systems)**
- **GBAS or SBAS Enhancements to GNSS**
- **Required Navigation Performance (RNP) based systems, and**
- **Enhanced or Synthetic Vision Based systems**

Enhanced vision systems are considered to be those systems using Infrared sensors or radar based sensor imagery. Such systems are again being proposed for civil use. While such systems or similar technical systems were proposed and tested in the 1960s and 70s, and in fact at least one system (a millimeter radar based system) was installed and used operationally in US air carrier service, such systems never achieved significant civil operational use. In recent decades, packaging, size, display technology, and cost have changed. There is again interest in installing and gaining operational experience with use of these systems, even though image performance in adverse weather is often limited by atmospheric physics and not system technology. This type of technology would be allowed ~~would be considered acceptable~~ (but not required) under this NPRM.

Synthetic vision systems—By contrast, are considered to be those systems that depict an image based on a synthetic vision image is a computer-generated image of the external scene topography derived from a stored digital database. The scene may be oriented from one or more locations on the perspective of aircraft (e.g., as would be seen by a pilot from the flight deck, or from some other location in or above the aircraft). that is derived from aircraft attitude, high precision navigation solution, database of terrain, obstacles, and relevant cultural features. A synthetic vision system is an electronic means to display a synthetic vision image of the external scene topography to the flight crew This NPRM would not provide for the use of this type of technology in the regulations; however, the FAA wishes to distinguish it from EFVS to be clear that synthetic vision systems are not being proposed as a means to comply with its flight visibility regulations. Such systems have been used previously, but credit has not been predicated on their use. Hence, this type of technology would continue to be considered acceptable for use (but is not required) under this regulation.

[Rationale: Many assertions of the original NPRM deleted text about SVS above are inaccurate, incorrect, or misleading. There has not been and is currently no regulatory bar to use of such SVS systems. In fact systems having these characteristics were also developed and implemented for use in the 1960s and 70s (specific US civil examples are available). Further, the NPRM provides no technically sound basis to justifiably and inherently discriminate between the merits of SVS, EVS, and other systems for certain specific low-visibility related tasks or applications]

Flight visibility -- Section 1.1 of 14 CFR defines the term "flight visibility" as " * * * the average forward horizontal distance, from the cockpit of an aircraft in flight, at which prominent unlighted objects may be seen and identified by day and prominent lighted objects may be seen and identified by night." Present ***FAA*** rules do not allow ***credit for the use of an EFVS systems presenting imagery outside of the visible spectrum, or for electronic means to present imagery in the visible spectrum for civil aircraft*** to determine flight visibility as defined in the FAA's regulations. ***Current rules also specify that once below DA(H) or MDA(H) if and as applicable, the flight visibility required must be equal to or greater than that specified by the applicable instrument procedure or authorization.*** The proposed rule would allow for the use of an EFVS to determine "enhanced flight visibility," and would permit descent and operation below decision height (DH), decision altitude (DA), or minimum descent altitude (MDA) based on the pilot's observation of images when using an

~~EFVS~~ **alternative visual reference requirements to assure safe landing, if based on systems or procedures that were found by FAA to perform acceptably and be safe.**

[Rationale: The original NPRM provision above, as written, is at best unjustified, inappropriate (even if valid), unfairly targets or favors only one particular technology, and without the justification of substantially more successful operating experience, could be unsafe in many frequently encountered operational circumstances.]

Section 91.175(c) and (d)--Section 91.175(c) and (d) of 14 CFR specifies flight visibility requirements for operations below DA or MDA and landing under IFR and states that, when making an instrument approach to a civil airport, a pilot must use a standard instrument approach procedure prescribed for the airport.

Paragraph (c), Operation below DH or MDA, states that, where a DH or MDA is applicable, no pilot may operate an aircraft, except a military aircraft of the United States, at any airport below the authorized MDA or continue an approach below the authorized DH unless the flight visibility under paragraph (c)(2) is not less than the visibility prescribed in the standard instrument approach being used. Paragraph (c)(3) lists visual references that must also be distinctly visible and identifiable to the pilot.

Paragraph (d), Landing, states that "No pilot operating an aircraft except a military aircraft of the United States, may land that aircraft when the flight visibility is less than the visibility prescribed in the standard instrument approach procedure being used."

Based upon the existing Sec. 91.175 regulation, the pilot cannot descend below the DH or MDA if the flight visibility is less than the visibility prescribed in the standard instrument approach procedure. The present Sec. 91.175(c)(2) flight visibility requirements are not based upon a pilot's use of an ~~EFVS~~ **either enhanced or synthetic vision systems.**

Previous type designs--In 2001, the FAA issued special conditions for the airworthiness approval of one manufacturer's type design **for installation of an enhanced vision system**. The special conditions limited the scope of the intended function to the identification of the visual references listed in Sec. 91.175(c)(3). The system design, under this **considering its** limited intended function, **was-has** not **been operationally** approved for meeting the flight visibility requirements of Sec. 91.175(c)(2). ~~Because its infrared sensor did not sense energy in the visual portion of the electromagnetic spectrum. In addition, the current operating rules do not establish criteria for the use of equipment that operates in non-visible portions of the electromagnetic spectrum. The~~ **Hence, this** proposed amendment would provide **a benchmark for assessment of performance of such systems, and if and where justified, would permit FAA to authorize use of alternative visual reference requirement criteria when applicable to such systems.** ~~operational criteria for the desired function of an EFVS, which operates outside the visible portion of the electromagnetic spectrum.~~

Related NPRM

The FAA is conducting a ~~thorough~~ review of its rules to ensure **clarity and** consistency between the operating rules of 14 CFR and future proposed area navigation (RNAV) operations for the ~~International National~~ **International** National Airspace System (**INAS**). On December 17, 2002, the FAA published a proposed rule entitled, "Area Navigation (RNAV) and Miscellaneous Amendments" (67 FR 77326; Dec. 17, 2002). That NPRM ~~would enable the~~ **intended to facilitate additional** use of space-based navigation aid sensors for aircraft RNAV systems through all phases of flight (departure, en route, arrival, and approach) to enhance the safety and efficiency of the **INAS**.

However, as a result of coordinated comments with that NPRM and the NPRM related to GPS use in Alaska, and adverse comments on both those NPRMs, both are being withdrawn and consolidated, with this Amended Notice.

~~The December 17, 2002 RNAV proposed rule also introduced the new terms "approach procedure with vertical guidance (APV)"~~

The terms DA, DH, MDA, and by inference MDH are consolidated into the revised terms DA(H) and MDA(H). ~~and "decision altitude (DA)."~~

In the **previous** NPRM, the FAA proposed to add definitions of these terms to Sec. 1.1 as follows:

~~"Approach procedure with vertical guidance (APV)" is an instrument approach procedure based on lateral path and vertical glide path. These procedures may not conform to requirements of precision approaches.~~ **The December 17, 2002, RNAV proposed rule introduced a new term: "approach procedure with vertical guidance (APV)." This term is now considered unnecessary, confusing, and unsuited for future approach procedures related either to the xLS or RNAV family of instrument approaches, using RNP based criteria. Accordingly, it is withdrawn. This Amended NPRM discontinues its use as unnecessary. Even if the term is temporarily used on a limited basis (e.g., in certain guidance material), it is inappropriate and unnecessary to codify it either in 14 CFR or in ICAO standards.**

[Rationale: APV, along with both precision approach (PA) and non-precision approach (NPA) terminology, as used in the original NPRM, are now adding to the confusion, not reducing confusion of classification of instrument approach procedures. With use of VNAV, RNP, performance-based NAV systems, linear criteria, and many forms of GNSS and GBAS evolving, the very notion of PA and NPA are no longer appropriate. They are now illogical and overlapping, fail to address important aspects of procedures, are a misnomer, are confusing and misleading; thus, their use should be discontinued. Instead, it is appropriate to refer to procedures as ILS or GLS, RNAV, or procedures other than ILS or GLS and RNAV].

Regarding the NPRM, commenters were correct in noting that terminology for DA, DH, and MDA were incomplete or inconsistent with ICAO. Hence, Decision Height and Minimum Descent Altitude in the previously issued NPRM. are now updated to be consistent with ICAO as the more appropriate "DA(H)" and

“MDA(H).” Accordingly, “Decision altitude-Altitude (Height) - (DA)-DA(H)” and “Minimum Descent Altitude (Height) MDA(H)” are specified in this amended NPRM. is a specified altitude at which a person must initiate a missed approach if the person does not see the required visual reference. Decision altitude is expressed in feet above mean sea level.”

— That NPRM also proposed to change Sec. 91.175(c) introductory text, 121.651(c) introductory text and (d) introductory text, 125.381(c), and a portion of 135.225(c), which would also be amended in this NPRM. The proposed amendments to those sections are, therefore, shown in this document with the proposed RNAV-related changes and the proposed EFVS-related changes in place. See the chart comparing the current rules and the RNAV and EFVS proposals following the Section-by-Section analysis below.

Discussion of the Proposal

The FAA proposes to amend its rules to ***more clearly*** allow for the operational use of an EFVS, which can display imagery that may significantly improve the pilot's capability to detect objects that may not otherwise be visible ***alternative types of technology and visual reference requirements***. The provisions of this NPRM would ***may*** apply to operations conducted under parts 91, 121, 125, 129, and 135.

The proposal also would provide that the pilot of an aircraft could use this system to determine “enhanced flight visibility” while flying a standard instrument approach procedure. An EFVS would enable the pilot to determine “enhanced flight visibility” at the DA, DH, or MDA, in lieu of “flight visibility” (as currently defined), by using a head-up display (HUD) to display sensor imagery of the approach lights or other visual references for the runway environment at a distance no less than the visibility prescribed in the instrument approach procedure being used.

[Rationale: The existing NPRM text is too-technology-specific, potentially unsafe as written (e.g., systems strictly meeting this rule could nonetheless lead pilots and aircraft into unsafe conditions), and as yet operationally unsupported and unjustified.]

The FAA would define “enhanced flight visibility” as the average forward horizontal distance, from the cockpit of an aircraft in flight, at which prominent topographical objects may be clearly distinguished and identified by day or night by a pilot using an EFVS. This definition would be substantially equivalent to the flight visibility requirement in Sec. 91.175(c)(2). The pilot would use this enhanced flight visibility and go through a similar decision-making process as required by existing regulations to continue the approach from the DA, DH, or MDA and safely maneuver the aircraft for a landing on the intended runway.

[Rationale: The existing NPRM text is too-technology-specific, potentially unsafe as written (e.g., systems strictly meeting this rule could nonetheless lead pilots and aircraft into unsafe conditions), and as yet operationally unsupported and unjustified.]

Possible operational benefits—This proposed rule would not require the use of an EFVS. However, using an EFVS would allow operations in reduced visibility

~~conditions that would not otherwise be possible. The proposed rule, therefore, could allow for operational benefits, reduce costs, and increase safety for aircraft equipped with an EFVS. Use of an EFVS with a HUD may improve the level of safety by improving position awareness, providing visual cues to maintain a stabilized approach, and minimizing missed approach situations. In addition to using an EFVS to satisfy Sec. 91.175(l) requirements, an EFVS may allow the pilot to observe an obstruction on the runway, such as an aircraft or vehicle, earlier in the approach, and observe potential runway incursions during ground operations in reduced visibility conditions. Even in situations where the pilot experiences marginal visibility at the DA, DH, or MDA, he or she could still use an EFVS to have better situational awareness than may be possible without it.~~

[Rationale: The existing NPRM text is too-technology-specific, potentially unsafe as written (e.g., systems strictly meeting this rule could nonetheless lead pilots and aircraft into unsafe conditions), and as yet operationally unsupported and unjustified.]

~~Category I operations—The intent of this proposed rule is to retain the existing straight-in landing Category I instrument landing system (ILS) or nonprecision instrument approach minima and to authorize the pilot to use FAA-certified EFVS imaging sensor technologies to determine enhanced flight visibility. This proposed rule would allow a pilot to fly a straight-in landing Category I or nonprecision approach and descend below the DA, DH, or MDA using an EFVS.~~

[Rationale: This is an inappropriate use and meaning of Category I. Since the 1980's in Op-Specs, and since 1999 in FAA Criteria, this use of Category I terminology is incorrect and inappropriate.]

Regarding definitions of approach categories, commenters correctly noted that, as proposed in the NPRM, the use of the term Category I, as being limited to ILS is entirely inappropriate. Category I, since the 1980s has applied not only to US ILS, GLS, and other instrument approaches in Operations-Specifications, but since 1999 has been additionally recognized in other appropriate FAA Advisory Circular Criteria. Hence, the use of Category I and II terminology in the NPRM is incorrect and inappropriate, and is withdrawn. Accordingly, Category I, II and III definitions are noted and retained for U.S. use as currently described in FAA ACs 120-29A and AC120-28D, and current Operations-Specifications. If and when ICAO definitions for Category I, II, and III are updated through FAA/JAA AWO or other harmonization activities, or otherwise agreed in ICAO, the U.S. will consider further amendments of these terms.

~~Category II and Category III ILS approach procedures—This proposed rule would not allow the use of an EFVS for Category II and III ILS approach procedures. Proposed enhanced flight vision systems for these approaches would have to comply with the more stringent reliability, redundancy, and other criteria, as prescribed in applicable sections of 14 CFR and applicable advisory circulars.~~

[Rationale: The use of Category II and III terminology in the section above is incorrect and inappropriate in this context, since many of the operations proposed for EFVS by the original EVS NPRM could be, in fact, Category II or III operations and are not Category I at all. This was recently correctly noted at

the international AWO meeting by representatives of both European operators and authorities. Hence, these provisions are much too technology-specific, misleading, and potentially unsafe as written (e.g., systems strictly meeting this rule could nonetheless lead pilots and aircraft into unsafe Cat II and III conditions), and are as yet operationally unsupported and unjustified].

~~Visual references—Section 91.175(c)(3) lists ten visual references, of which only one is required for the pilot to descend below the DH or MDA. The visual references are: (1) The approach light system, (2) threshold, (3) threshold markings, (4) threshold lights, (5) runway end identifier lights, (6) visual approach slope indicator, (7) touchdown zone or touch down zone markings, (8) touchdown zone lights, (9) runway or runway markings, and (10) the runway lights. If the approach light system is used as the reference, the pilot may not descend below 100 feet above the touchdown zone elevation unless the red terminating bars or the red side row bars are also distinctly visible and identifiable. As a parallel, the proposed rule states that, when using an EFVS, the approach light system (if installed), the runway threshold lights or markings, and the runway touchdown zone lights or markings would have to be distinctly visible and identifiable to the pilot.~~

[Rationale: The existing NPRM text is too-technology-specific, potentially unsafe as written (e.g., systems strictly meeting this rule could nonetheless lead pilots and aircraft into unsafe conditions), and as yet operationally unsupported and unjustified. Instead, insert the following:].

With regard to proposed revisions of 14 CFR § 91.175(c)(3), commenters correctly noted that provisions for "red terminating bars" or "red side row bars" are no longer considered necessary or appropriate, because safe operations have been accomplished for many years on approach lighting systems without these features. Hence, those phrases are dropped as a qualifier from the approach light description of visual references in §91.175(c)(3).

~~Because the imaging sensor technologies may not sense or display all of the identifying features of the visual references (e.g., may not distinguish colored lights), the FAA is proposing that the approach light system (if installed), or the runway threshold and the touchdown zone, would have to be distinctly visible to the pilot when using the EFVS prior to descent from the DA, DH, or MDA. At 100 feet above the touchdown zone elevation and below, there would have to be sufficient flight visibility (without reliance on an EFVS) for the intended runway to be distinctly visible and identifiable to the pilot to continue to a landing.~~

[Rationale: The existing NPRM text is too-technology-specific, potentially unsafe as written (e.g., systems strictly meeting this rule could nonetheless lead pilots and aircraft into unsafe conditions), and as yet operationally unsupported and unjustified.]

~~Pilot qualifications—To use the EFVS equipment while conducting an instrument approach procedure under this proposal, the pilot(s) would have to be current and qualified in accordance with existing applicable requirements in 14 CFR part 61, 121, 125 or 135. Each foreign pilot would have to be qualified in accordance with the requirements of the civil aviation authority of the State of the operator. Foreign air carriers would be required to comply with this rule and their operations specifications. For all operators, this would include knowledge of the EFVS training requirements,~~

~~operational procedures, and limitations as prescribed in the approved Airplane or Rotorcraft Flight Manual for the specific system.~~

[Rationale: The existing NPRM text is too-technology-specific, potentially unsafe as written (e.g., systems strictly meeting this rule could nonetheless lead pilots and aircraft into unsafe conditions), and as yet operationally unsupported and unjustified.]

~~Certification process—An EFVS proposed for use under this proposed rule would have to provide the pilot with sufficient guidance and visual cues so that the pilot could manually maneuver the aircraft to a landing on the intended runway. The sensor image alone may not be suitable to maneuver the aircraft. For the pilot(s) to maximize situational awareness while maneuvering the aircraft in the visual segment of the instrument approach procedure, at low altitudes and reduced visibility conditions, the FAA is proposing that several key components be provided by an EFVS to provide an adequate level of safety. The EFVS sensor imagery would have to be presented on a HUD that is centrally located in the pilot's primary field of view and in the pilot's line of vision along the flight path. The imagery must be real-time, independent of the navigation solution derived from the aircraft avionics, and must be clearly displayed so that it does not adversely obscure the pilot field of view through the cockpit window. Aircraft flight symbology, such as airspeed, vertical speed, attitude, heading and altitude would have to be displayed on the HUD and be clearly visible to the pilot. The displayed sensor imagery and aircraft symbology could not adversely obstruct the pilot's vision looking through the aircraft's forward windshield.~~

[Rationale: The existing NPRM text is too-technology-specific, potentially unsafe as written (e.g., systems strictly meeting this rule could nonetheless lead pilots and aircraft into unsafe conditions), and as yet operationally unsupported and unjustified.]

The ***If a system were proposed, the*** FAA would conduct the certification and evaluation process in accordance with published guidance and current policy. The FAA would also evaluate the capabilities, operational procedures, training, and limitations for the specific system as it is designed and flight-tested. In all cases, the applicant for an airworthiness type design would provide the FAA's Aircraft Certification Office (ACO) with a certification plan. The FAA would evaluate the plan to determine if it is addressed by current regulations or if special conditions would have to be established for the certification. The ***As necessary, the*** proposed ***system or procedures*** would be evaluated in an operational context to determine if the system provides an equivalent level of safety when in operation compared to the present rules.

[Rationale: Too technology-specific as written.]

Section-by-Section Analysis

Section 1.1 General Definitions

The FAA ***withdraws proposals for changes to 14 CFR Part 1, except to update terminology for DA(H) and MDA(H).*** ~~proposes to amend Sec. 1.1 to add~~

definitions for the terms “enhanced flight visibility,” and “enhanced flight vision system (EFVS).” Including these terms in the FAA’s regulations would allow for the use of new technology and establish the characteristics the FAA believes are essential for safe operations.

—The FAA also proposes to add definitions for the terms “synthetic vision” and “synthetic vision system.” Although this proposed rule would not allow for synthetic vision, which is a database computer-generated image, the FAA believes it is necessary to distinguish it from an enhanced vision system, which uses imaging-sensor technology.

[Rationale: The existing NPRM text is too-technology-specific, potentially unsafe as written (e.g., systems strictly meeting this rule could nonetheless lead pilots and aircraft into unsafe conditions), and as yet operationally unsupported and unjustified.]

Section 1.2 Abbreviations and Symbols

The FAA is proposing to add the abbreviation “EFVS” **DA(H) and MDA(H)** to Sec. 1.2 to reflect the addition of the proposed new term “enhanced flight vision system (EFVS)” in Sec. 1.1. **common US and ICAO usage.**

Section 91.175 Takeoff and Landing Under IFR

Paragraph (b) would be revised to reflect appropriate DA(H) and MDA(H) US and ICAO current terminology.

Paragraph (c)(3)(i) **would be revised to simply list the “approach light system” as an acceptable item, and remove any reference to red terminating or red side row bars.** introductory text (as proposed at 67 FR 77341; Dec. 17, 2002), would be further amended to add the phrase “except as provided in Sec. 91.175(l) of this section, * * *.” As discussed below, paragraph (l) would be added to allow the pilot to descend below the DA, DH, or MDA on a standard instrument approach using an EFVS. If a pilot cannot meet the requirements of Sec. 91.175(c) using natural vision, the exception to those requirements as provided in paragraph (l) using an EFVS would apply.

[Rationale: The existing NPRM text is too-technology-specific, potentially unsafe as written (e.g., systems strictly meeting this rule could nonetheless lead pilots and aircraft into unsafe conditions), and as yet operationally unsupported and unjustified.]

Paragraph (d)—The FAA proposes to revise paragraph (d) to add a new requirement that no pilot operating an aircraft may land that aircraft when, for operations conducted under proposed paragraph (l), the requirements of proposed paragraph (l)(4) are not met. This would mean that, when the aircraft is operated from 100 feet above the touchdown zone elevation to the runway surface, without reliance on an EFVS, there would have to be sufficient flight visibility for the lights or markings of the threshold or the lights or markings of the touchdown zone to be distinctly visible and identifiable to the pilot to land the aircraft. For all other operations that are not

conducted under Sec. 91.175(l), the pilot could not land the aircraft if the flight visibility is less than the visibility prescribed in the standard instrument approach procedure being used.

[Rationale: The existing NPRM text is too-technology-specific, potentially unsafe as written (e.g., systems strictly meeting this rule could nonetheless lead pilots and aircraft into unsafe conditions), and as yet operationally unsupported and unjustified.]

Paragraph (e) For the missed approach procedures in Sec. 91.175(e), the FAA is proposing to revise the introduction to (e)(1) to add a reference to proposed paragraph (l). The operator of the aircraft first would have to determine whether the aircraft would be operated in accordance with Sec. 91.175(c) (for flight visibility using natural vision) or with Sec. 91.175(l) (using an EFVS). Once that decision is made, different requirements determine when a missed approach must be executed. If a pilot chose to operate under Sec. 91.175(c) without an EFVS, he or she would follow existing rules for missed approaches. This proposed rule would not change the existing requirements under Sec. 91.175(c).

[Rationale: The existing NPRM text is too-technology-specific, potentially unsafe as written (e.g., systems strictly meeting this rule could nonetheless lead pilots and aircraft into unsafe conditions), and as yet operationally unsupported and unjustified.]

If, on the other hand, the pilot chose to use an EFVS in accordance with Sec. 91.175(l), the missed approach procedures remain the same as those published on the approach charts. If the pilot could not meet the requirements of Sec. 91.175(l)(1) through (4), a missed approach must be executed. The requirements of Sec. 91.175(l)(1) through (4) differ from the requirements of Sec. 91.175(c)(1) through (3); however, these requirements provide a parallel to the decision-making process in Sec. 91.175(c). For an operation conducted under Sec. 91.175(l) with an EFVS, between the DA, DH, or MDA to 100 feet above the touchdown zone elevation of the runway of intended landing, an appropriate missed approach procedure would have to be immediately executed if the pilot were unable to continuously maintain the aircraft in a position from which a descent to a landing on the intended runway could be made at a normal rate of descent using normal maneuvers. For an operation conducted under part 121 or part 135, an appropriate missed approach procedure would have to be immediately executed if the pilot were unable to control the descent rate of the aircraft to allow touchdown to occur within the touchdown zone of the runway of intended landing. Under (l)(2), for all operations, below DA, DH, or MDA an appropriate missed approach procedure would have to be immediately executed when the pilot determined that the enhanced flight visibility observed by use of an EFVS is less than the visibility prescribed in the standard instrument approach procedure being used. Also if the visual references specified under (l)(3) were not distinctly visible and identifiable to the pilot in the EFVS display, a missed approach would have to be executed. Under (l)(4), for operations, between 100 feet above the touchdown zone elevation of the runway of intended landing and any lower altitude, the pilot would have to immediately execute a missed approach if, without reliance on an EFVS, there were not sufficient flight visibility for either the lights or markings of the threshold or the lights or markings of the touchdown zone to be distinctly visible and identifiable to the pilot.

[Rationale: The existing NPRM text is too-technology-specific, potentially unsafe as written (e.g., systems strictly meeting this rule could nonetheless lead pilots and aircraft into unsafe conditions), and as yet operationally unsupported and unjustified.]

Paragraph (f) would be revised in §91.175 to rationalize takeoff minima. Current provisions for specifying 1 mile visibility for two-engine aircraft while specifying ½ mile visibility for 3 and 4 engine aircraft are no longer valid. The original differences in this rule related to aircraft characteristics that are no longer pertinent to the majority of transport aircraft (e.g., use of tail wheel transport aircraft, use of failure prone radial piston engines). Hence, there is no current reason why an airplane such as a B-777 or A320 need apply a 1-mile visibility restriction when a four-engine aircraft like a B-707 or DC-6 may use a ½-mile visibility restriction. Accordingly, a minimum of ½ mile is now specified as basic for any air carrier aircraft operation, if not otherwise addressed by Operations-Specifications.

Paragraph (l) would be added to § 91.175 to describe the ~~alternative~~ requirements for ***the Administrator to approve systems or procedures, or approve use of alternative visual reference requirements.***

For example, for Part 121 operations using the new harmonized FAA/JAA minima, the Administrator might specify use of "safe visual reference" as noted in the new added paragraph (l). Similarly, for those general aviation operations under Part 91 using VNAV path capability, or equivalent, with a continuous descent approach to a DA(H), the administrator might specify use of "safe visual reference" as a standard in lieu of current provisions in paragraphs (c)(2), and (d). approach to straight-in landing operations below DA, DH, or MDA using an EFVS. The proposed rule would apply to pilots operating under parts 91, 121, 125, 129 and 135, and would require that parts 119 and 125 certificate holders, and part 129 operations specifications holders, be authorized to use an EFVS in their operations specifications.

[Rationale: The existing NPRM text is too-technology-specific, potentially unsafe as written (e.g., systems strictly meeting this rule could nonetheless lead pilots and aircraft into unsafe conditions), and as yet operationally unsupported and unjustified.]

Paragraph (l)(1) would state that the aircraft must be continuously in a position from which a descent, at normal rate using normal maneuvers, can be made. The proposed paragraph would also state that the descent rate for parts 121 and 135 operations would allow touchdown to occur within the touchdown zone of the runway of intended landing.

[Rationale: The existing NPRM text is too-technology-specific, potentially unsafe as written (e.g., systems strictly meeting this rule could nonetheless lead pilots and aircraft into unsafe conditions), and as yet operationally unsupported and unjustified.]

Proposed paragraph (l)(2) would provide an enhanced flight visibility requirement that would be equivalent to Sec. 91.175(c)(2) and 121.651(c)(2) and

~~(d)(2), except that the pilot could use an EFVS to determine “enhanced flight visibility” as compared to “flight visibility” with natural vision.~~

[Rationale: The existing NPRM text is too-technology-specific, potentially unsafe as written (e.g., systems strictly meeting this rule could nonetheless lead pilots and aircraft into unsafe conditions), and as yet operationally unsupported and unjustified.]

~~Paragraph (l)(3) would specify that the approach light system (if installed) or the runway threshold and the touchdown zone would have to be distinctly visible and identifiable to the pilot in the enhanced flight vision system display at the DA, DH, or MDA.~~

[Rationale: The existing NPRM text is too-technology-specific, potentially unsafe as written (e.g., systems strictly meeting this rule could nonetheless lead pilots and aircraft into unsafe conditions), and as yet operationally unsupported and unjustified.]

~~Paragraph (l)(4) would require that, at 100 feet above the touchdown zone elevation and below, the threshold lights or markings, or the touchdown zone lights or markings, would have to be distinctly visible and identifiable without relying on the enhanced flight vision system for the pilot to continue to a landing.~~

[Rationale: The existing NPRM text is too-technology-specific, potentially unsafe as written (e.g., systems strictly meeting this rule could nonetheless lead pilots and aircraft into unsafe conditions), and as yet operationally unsupported and unjustified.]

~~In (l)(5), the proposed rule would provide that pilots using EFVS-equipped aircraft be qualified in accordance with the applicable requirements of 14 CFR part 61 and part 121, 125, or 135, as applicable. Foreign operators would have to be qualified in accordance with their civil aviation authorities' requirements.~~

[Rationale: The existing NPRM text is too-technology-specific, potentially unsafe as written (e.g., systems strictly meeting this rule could nonetheless lead pilots and aircraft into unsafe conditions), and as yet operationally unsupported and unjustified.]

~~In (l)(6), the proposed rule would authorize EFVS operations for parts 119 and 125 certificate holders and part 129 operations specifications holders through their operations specifications.~~

[Rationale: NPRM text too technology-specific, and potentially unsafe as written (e.g., systems strictly meeting this rule could nonetheless lead pilots and aircraft into unsafe conditions), and as yet operationally unsupported and unjustified - it would be most inappropriate to include specific EVS provisions for FAR 121, 135, and 129 in this proposal at this time. Operational utility and safety of operations as implied by this NPRM, as well as legitimate "proof of concept" are far from established at this point. Concerning FAR 129 operators, JAA and other European representatives expressed recent concerns about such operations, particularly considering that those EVS operations are more appropriately termed Cat II or III, than Cat I].

~~In (l)(7), the proposed rule would require that the aircraft be equipped with an EFVS, the display of which would have to be suitable for maneuvering the aircraft. The EFVS and display would be required to have an FAA type design approved by the United States. For foreign-registered aircraft, the EFVS and display would have to be of a type design approved by the United States and comply with all requirements as if the aircraft were registered in the United States.~~

[Rationale: The existing NPRM text is too-technology-specific, potentially unsafe as written (e.g., systems strictly meeting this rule could nonetheless lead pilots and aircraft into unsafe conditions), and as yet operationally unsupported and unjustified.]

~~Paragraph (m) Proposed paragraph (m) would establish the characteristics and features the FAA would require when approving an EFVS. It would ensure that a pilot using an EFVS remained in his or her normal sitting position and would be looking straight ahead along the forward flight path. The EFVS would have to include a head-up display centrally located in the pilot's primary field of view and would display the sensor imagery and the aircraft's flight's symbology so that the pilot's forward vision would not be adversely obscured. Because the pilot could not rely on the EFVS at 100 feet above the touchdown zone elevation and below for purposes of identifying items in proposed (l)(4), the FAA believes it would be essential for him or her to remain in a forward-looking position and be able to focus outside the cockpit with minimal transition from using the sensor imagery display to visual flying conditions (using natural vision) without the EFVS. The display characteristics and dynamics would have to be suitable for manual control of the aircraft.~~

[Rationale: The existing NPRM text is too-technology-specific, potentially unsafe as written (e.g., systems strictly meeting this rule could nonetheless lead pilots and aircraft into unsafe conditions), and as yet operationally unsupported and unjustified.]

~~Section 121.651 Takeoff and Landing Weather Minimums: IFR: All Certificate Holders~~

[Rationale: Extending the former NPRM text to Part 121,135, and 129 is potentially unsafe as written (e.g., systems strictly meeting this rule could nonetheless lead pilots and aircraft into unsafe conditions), and are as yet operationally unsupported and unjustified - it would be most inappropriate to include specific EVS provisions Part FAR 121, 135, and 129 in this proposal at this time. Operational utility and safety of operations as implied by this NPRM, as well as legitimate "proof of concept" are far from established at this point. Concerning Part 129 operators, JAA and other European representatives expressed recent concerns about such operations, particularly considering that those EVS operations are more appropriately termed Cat II or III, than Cat I].

~~The FAA's Area Navigation (RNAV) NPRM published on December 17, 2002 (67 FR 77341; Dec. 17, 2002), set forth proposed amendments to the current provisions contained in Sec. 121.651. By **[[Page 6806]]** this document (i.e., the~~

Enhanced Flight Visibility Systems NPRM), the FAA amends the December 17, 2002 RNAV NPRM regarding this section in three ways.

First, in regard to paragraph (c) in the December 17, 2002 RNAV NPRM, the FAA makes the following amendments: The words “and touch down” would be removed. Thus, regardless of which proposals are adopted first (i.e., RNAV or EFVS), those three words would be removed from paragraph (c) of Sec. 121.651. The FAA is proposing to remove those words because it believes they are redundant of the landing requirements in both the existing and the proposed Sec. 91.175(d), which also apply to part 121 operations.

[Rationale: NPRM text too-technology-specific, potentially unsafe as written (e.g., systems strictly meeting this rule could nonetheless lead pilots and aircraft into unsafe conditions), and as yet operationally unsupported and unjustified.]

Second, in paragraph (c), the words “if either the requirements of Sec. 91.175(l) of this chapter, or the following requirements are met” would be added at the end. Thus, if the proposed amendments in this EFVS NPRM are adopted at the same time as the RNAV NPRM or after the adoption of the RNAV proposals, then today's proposal would allow for operations under the current requirements of Sec. 121.651(c), or approach to straight in landing operations using an EFVS under Sec. 91.175(l) when the EFVS proposals are adopted. By the same token, if the RNAV proposed rules are adopted before the EFVS proposals are adopted, then the language in proposed Sec. 121.651(c) in this document would be adopted but without the reference to Sec. 91.175(l). That is, the FAA would adopt proposed paragraph (c) without the clause “* * * either the requirements of Sec. 91.175(l) of this chapter or * * *.” Thus, in this situation, that language would only be adopted when the substantive EFVS rules are adopted.

[Rationale: Revising this text in FAR 121,135, and 129 is potentially unsafe as written (e.g., this rule in this manner could lead pilots and aircraft into unsafe conditions), and are as yet operationally unsupported and unjustified].

Third, in paragraph (d), by this document (i.e., the Enhanced Flight Visibility Systems NPRM), the FAA amends its December 17, 2002 proposal. Paragraph (d) introductory text, as proposed in the FAA's Area Navigation (RNAV) NPRM published on December 17, 2002 (67 FR 77341; Dec. 17, 2002), would be further revised to include the words “the requirements of Sec. 91.175(l) of this chapter, or the following requirements are met” at the end. This would allow for operations under the current requirements of Sec. 121.651(d), or approach to straight in landing operations using an EFVS under Sec. 91.175(l). (Note that the abbreviation “PAR” stands for “precision approach radar.”) Thus, if the RNAV proposal is adopted first, then the new proposed language in proposed Sec. 121.651(d) in this document (i.e., “* * * the requirements of Sec. 91.175(l) of this chapter, or the following requirements are met: * * *”) would not be adopted at that time but would only be adopted when, and if, the proposals in the EFVS NPRM are adopted.

[Rationale: Revising this text in FAR 121,135, and 129 is potentially unsafe as written (e.g., this rule in this manner could lead pilots and aircraft into unsafe conditions), and are as yet operationally unsupported and unjustified].

~~Section 125.381 Takeoff and Landing Weather Minimums: IFR~~

~~_____ The FAA is proposing to further amend paragraph (c) as proposed in the FAA's Area Navigation (RNAV) NPRM published on December 17, 2002 (67 FR 77346). There are several reasons for the FAA's actions. First, as currently published in the Code of Federal Regulations, it appears as if a clause that is wholly contained within paragraph (c)(3) only applies to (c)(3), when, in fact, that language was, and is, intended to apply to paragraphs (c)(1), (c)(2) and (c)(3). That language begins " * * * the approach may be continued * * * ." Thus, in this proposal, the FAA has reorganized the regulatory language to more clearly set forth the requirements.~~

~~_____ Second, the FAA proposes to remove language in the current rule (i.e., " * * * and a landing may be made * * * ") and similar language (i.e., " * * * and landing * * * ") in the RNAV NPRM. The FAA is proposing this because this language is redundant of the regulatory requirements in the existing Sec. 91.175(d), which does, and would continue to, apply to part 125 operators, and it is redundant of the proposed requirements in proposed Sec. 91.175(d).~~

~~_____ Third, all of the following changes to the proposed Sec. 125.381(c) in the RNAV NPRM that are described in this paragraph would be adopted regardless of which rule is adopted first. In other words, the section and paragraph citations below are in reference to the proposed regulatory sections and paragraphs in the RNAV NPRM. Moreover, if the proposals in the EFVS NPRM are adopted first, the changes described below would amend the current Sec. 125.381(c), even though the other proposals in the RNAV NPRM would not have been adopted at that point. The FAA is proposing to amend the end of paragraph (c) introductory text by changing the words, "continue with the approach and landing only if both of the following conditions are met—" to read "continue with the approach only if the requirements of Sec. 91.175(l) of this chapter, or both of the following conditions are met--." The FAA is also proposing to make technical corrections to paragraph (c)(1) to specify that the airplane would have to be in one of the prescribed approach phases of the flight (not a landing phase) when a later weather report is received indicating below minimum conditions, or the pilot in command would not be authorized to continue the approach to DA, DH, or MDA. Also, in (c)(1)(i), the word "approach" would be added after "APV" to improve readability. In (c)(1)(iii), the paragraph would be reworded to define the final approach on ASR/PAR (airport surveillance radar/precision approach radar) procedures and be renumbered as (c)(1)(ii). Paragraph (c)(1)(ii) would be renumbered as (c)(1)(iii) and be rewritten to more specifically describe the airplane position during the nonprecision final approach. In paragraph (c)(2) of the RNAV proposal (and in paragraph (c)(3) of the existing rule), the reference to "MAP" (missed approach point) would be corrected with "MDA." Also in paragraph (c)(2) of the RNAV proposal the reference to the words "in the certificate holder's operations specifications" would be replaced with the words "for the procedure being used" because the minimums would not be prescribed in operations specifications. If only the RNAV proposal is adopted, the changes described above would be included in the RNAV final rule except for references to Sec. 91.175(l).~~

[Rationale: As with Part 121, revising this text in Part 125 in the manner proposed is potentially unsafe, as written (e.g., this rule in this manner could lead pilots and aircraft into unsafe conditions), and is as yet operationally unsupported and unjustified].

~~Section 135.225 IFR: Takeoff, Approach, and Landing Minimums~~

~~_____ The FAA is proposing to further amend Sec. 135.225(c) as proposed in the FAA's Area Navigation (RNAV) NPRM published on December 17, 2002 (67 FR 77346). There are several reasons for the FAA's actions. First, as currently published in the Code of Federal Regulations, it appears that the clause, " * * * the approach may be continued and a landing made * * *" in paragraph (c)(3)(ii) only applies to (c)(3)(ii), when, in fact, that language was, and is, intended to apply to paragraphs (c)(1), (c)(2), and (c)(3)(i) as well. Second, in this proposal, the words "and a landing made" would be removed. Additionally, a second clause in (c)(3)(ii) beginning with the words " * * * if a pilot finds * * *" would be recodified as a new condition for paragraph (c). This would be renumbered as (c)(2). All of the paragraphs in (c)(1) would be renumbered and the content of those paragraphs would mirror the proposal of Sec. 125.381 as explained above, except that the word "aircraft" would be used instead of "airplane." The proposed changes to the sections and paragraphs of the RNAV NPRM in this EFVS NPRM would be adopted regardless of which rule is adopted first. However, if only the RNAV proposal is adopted, these proposed changes would be included in the RNAV final rule except for references to Sec. 91.175(l). The proposed changes in the RNAV NPRM are no longer being considered for adoption.~~

[Rationale: As with Part 121, revising this text in Part 135 in the manner proposed is inappropriate and potentially unsafe, as written (e.g., this rule in this manner could lead pilots and aircraft into unsafe conditions), and is as yet operationally unsupported and unjustified].

[Rationale: The proposals below are each inappropriate for the reasons cited earlier. In lieu of the proposals below the text of Attachment 3 of these comments should be used.]

[[Pages 6807-6810]]

Sec. 91.175 Current Rule

Sec. 91.175 Takeoff and landing under IFR.

(c) Operation below DH or MDA. Where a DH or MDA is applicable, no pilot may operate an aircraft, except a military aircraft of the United States, at any airport below the authorized MDA or continue an approach below the authorized DH unless—

(d) Landing. No pilot operating an aircraft, except a military aircraft of the United States, may land that aircraft, when the flight visibility is less than the visibility prescribed in the standard instrument approach procedure being used.

RNAV Proposed Rule

Sec. 91.175 Takeoff and landing under IFR.

(c) Operation below DA/DH or MDA. Where a DA/DH or MDA is applicable, no pilot may operate an aircraft, except military aircraft of the United States, at any airport below the authorized MDA or continue an approach below the authorized DA/DH unless—

EFVS Proposed Rule

Sec. 91.175 Takeoff and landing under IFR.

(c) Operation below DA, DH or MDA. Except as provided in paragraph (1) of this section, where a DA, DH or MDA is applicable, no pilot may operate an aircraft, except a military aircraft of the United States, at any airport below the authorized MDA or continue an approach below the authorized DA/DH unless—

(d) Landing. No pilot operating an aircraft, except a military aircraft of the United States, may land that aircraft when—

- (1) For operations conducted under paragraph (1) of this section, the requirements of (1)(4) of this section are not met; or
- (2) For all other part 91 operations and parts 121, 125, 129, and 135 operations, the flight visibility is less than the visibility prescribed in the standard instrument approach procedure being used.

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~~(e) Missed approach procedures. Each pilot operating an aircraft, except a military aircraft of the United States, shall immediately execute an appropriate missed approach procedure when either of the following conditions exist: (1) Whenever the requirements of paragraph (e) of this section are not met at either of the following times:~~

~~(i) When the aircraft is being operated below MDA; or~~

~~(ii) Upon arrival at the missed approach point, including a DH where a DH is specified and its use is required, and at any time after that until touchdown.~~

~~(ii) Upon arrival at the missed approach point, including a DA/DH where a DA/DH is specified and its use is required, and at any time after that until touchdown.~~

~~(1) * * *~~

~~(e) * * *~~

~~(1) Whenever operating an aircraft pursuant to paragraph (e) or (1) of this section and the requirements of that paragraph are not met at either of the following times:~~

~~(1) Approach to straight in landing operations below DA, DH, or MDA using an enhanced flight vision system (EFVS). No pilot operating under this section or Sec. 121.651, 125.381, and 135.225 of this chapter may operate an aircraft at any airport below the authorized MDA or continue an approach below the authorized DA or DH and land unless—~~

~~(1) The aircraft is continuously in a position from which a descent to a landing on the intended runway can be made at a normal rate of descent using normal maneuvers, and, for operations conducted under part 121 or part 135 of this chapter, the descent rate will allow touchdown to occur within the touchdown zone of the runway of intended landing;~~

~~(2) The pilot determines that the enhanced flight visibility observed by use of a certified enhanced flight vision system is not less than the visibility prescribed in the standard instrument approach procedure being used;~~

~~(3) The following visual references for the intended runway are distinctly visible and identifiable to the pilot using the enhanced flight vision system:~~

~~(i) The approach light system (if installed); or~~

~~(ii) The runway threshold and the touchdown zone;~~

~~(4) At 100 feet above the touchdown zone elevation of the runway of intended landing and below that altitude, the flight visibility must be sufficient for the following to be distinctly visible and identifiable to the pilot without reliance on the enhanced flight vision system to continue to a landing:~~

~~(i) The lights or markings of the threshold; or~~

~~(ii) The lights or markings of the touchdown zone;~~

~~(5) The pilot(s) is qualified to use an EFVS as follows:~~

~~(i) For parts 119 and 125 certificate holders, the applicable training, testing and qualifications provisions of parts 121, 125 and 135 of this chapter;~~

~~(ii) For foreign persons, in accordance with the requirements of the requirements of the civil aviation authority of the State of the operator; or~~

~~(iii) For persons conducting any other operation, in accordance with the applicable qualification and proficiency requirements of part 61 of this chapter and the operating limitations specified in the approved Airplane or Rotorcraft Flight Manual;~~

~~(6) For parts 119 and 125 certificate holders, their operations specifications authorize use of EFVS; and~~

~~(7) The aircraft is equipped with, and the pilot uses, an enhanced flight vision system, the display of which is suitable for maneuvering the aircraft and his either an FAA type design approval or, for a foreign registered aircraft, the EFVS is of a type design approved by the United States and complies with all of the requirements of this chapter that would be applicable to that aircraft were it registered in the United States, including the requirements for a U.S. standard airworthiness certificate.~~

~~(m) For purposes of this section, “enhanced flight vision system” (EFVS) is an installed airborne system comprised of the following features and characteristics:~~

~~(1) An electronic means to provide a display of the forward external scene topography (natural or manmade features of a place or region especially in a way to show their relative positions and elevation) through the use of imaging sensors, such as a forward looking infrared, millimeter wave radiometry, millimeter wave radar, and low light level image intensifying;~~

~~(2) The EFVS sensor imagery and aircraft flight symbology (i.e. at least airspeed, vertical speed, aircraft attitude, heading, altitude) are presented on a head-up display so that they are clearly visible to the pilot flying in his or her normal position and line of vision and looking forward along the flight path;~~

~~(3) The displayed imagery and aircraft flight symbology does not adversely obscure the pilot's outside view or field of view through the cockpit window;~~

(4) The EFVS includes the display element, sensors, computers and power supplies, indications, and controls. It may receive inputs from an airborne navigation system or flight guidance system; and

(5) The display characteristics and dynamics are suitable for manual control of the aircraft.

Sec. 121.651 Current Rule

Sec. 121.651 Takeoff and landing weather minimums: IFR: All certificate holders.

(c) If a pilot has begun the final approach segment of an instrument approach procedure in accordance with paragraph (b) of this section and after that receives a later weather report indicating below minimum conditions, the pilot may continue the approach to DH or MDA. Upon reaching DH or at MDA, and at any time before the missed approach point, the pilot may continue the approach below DH or MDA and touch down if—

(d) A pilot may begin the final approach segment of an instrument approach procedure other than a Category II or Category III procedure at an airport when the visibility is less than the visibility minimums prescribed for that procedure if that airport is served by a operative ILS and an operative PAR, and both are used by the pilot. However, no pilot may operate an aircraft below the authorized MDA, or continue an approach below the authorized DH, unless—

RNAV Proposed Rule

Sec. 121.651 Amended

(c) In paragraph (c), replace the term “DH” with the term “DA/DH” wherever it appears.

(d) A pilot may begin the final approach segment of a Category I precision approach procedure at an airport when the visibility is less than the visibility minimums prescribed for that procedure if that airport is served by an operative PAR and another operative precision instrument approach system, and both the PAR and the precision approach are used by the pilot. However, no person may continue an approach below the authorized DA, unless—

EFVS Proposed Rule

Sec. 121.651 Takeoff and landing weather minimums: IFR: All certificate holders.

(c) If a pilot has begun the final approach segment of an instrument approach procedure in accordance with paragraph (b) of this section, and after that receives a later weather report indicating below minimum conditions, the pilot may continue the approach to DA/DH or MDA. Upon reach DA/DH, or at MDA, and at any time before the missed approach point, the pilot may continue the approach below DA/DH or MDA if either the requirements of Sec. 91.175(l) of this chapter, or the following requirements are met:

(d) A pilot may begin the final approach segment of a Category I precision approach procedure at an airport when the visibility is less than the visibility minimums prescribed for that procedure if that airport is served by an operative PAR and another operative precision instrument approach system, and both the PAR and the precision approach are used by the pilot. However, no person may continue an approach below the authorized DA unless the requirements of Sec. 91.175(l) of this chapter, or the following requirements are met:

Sec. 125.381 Current Rule

Sec. 125.381 Takeoff and landing weather minimums: IFR.

(c) If a pilot initiates an instrument approach procedure when the latest weather report indicates that the specified visibility minimums exist, and a later weather report indicating below minimums conditions is received after the airplane—

(1) Is on an ILS final approach and has passed the outer marker;

(2) Is on final approach segment using a nonprecision approach procedure; or

RNAV Proposed Rule

Sec. 125.381 Takeoff and landing weather minimums: IFR.

(c) If a pilot initiates an instrument approach procedure based on a weather report that indicates that the specified visibility minimums exist and subsequently receives another weather report that indicates that conditions have worsened to below the minimum requirements, then the pilot may continue with the approach and landing only if both of the following conditions are met—

(1) The later weather report is received when the airplane is in one of the following landing phases:

(i) The airplane is on a precision approach or APV and has passed the precision final approach fix.

(ii) The airplane is on the final approach segment using a nonprecision approach procedure.

(iii) The airplane is on a PAR final approach and has been turned over to the final approach controller.

(2) The pilot in command finds, on reaching the authorized MAP or DA/DH, that the actual weather conditions are at or above the minimums prescribed in the certificate holders' operations specifications.

EFVS Proposed Rule

Sec. 125.381 Takeoff and landing weather minimums: IFR.

(c) If a pilot initiates an instrument approach procedure based on a weather report that indicates that the specified visibility minimums exist and subsequently receives another weather report that indicates that conditions are below the minimum requirements, then the pilot may continue with the approach only if, the requirement of Sec. 91.175(l) of this chapter, or both of the following conditions are met—

(1) The later weather report is received when the airplane is in one of the following approach phases:

(i) The airplane is on a precision or APV approach and has passed the precision final approach fix;

(ii) The airplane is on an ASR or PAR final approach and has been turned over to the final approach controller; or

(iii) The airplane is on a nonprecision final approach and the airplane—

(A) Has passed the appropriate facility or final approach fix; or

(B) Where a final approach fix is not specified, has completed the procedure turn and is established inbound toward the airport on the final approach course within the distance prescribed in the procedure; and

(2) The pilot in command finds, on reaching the authorized MDA, or DA/DH, that the actual weather conditions are at or above the minimums prescribed for the procedure being used.

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~~(3) Is on PAR final approach and has been turned over to the final approach controller, the approach may be continued and a landing may be made if the pilot in command finds, upon reaching the authorized MAP or HD, that actual weather conditions are at least equal to the minimums prescribed in the operations specifications.~~

Sec. 135.225 Current Rule

Sec. 135.225 IFR: Takeoff, approach and landing minimums.

~~(c) If a pilot has begun the final approach segment of an instrument approach to an airport under paragraph (b) of this section and a later weather report indicating below minimum conditions is received after the aircraft is—~~

~~(1) On an ILS final approach and has passed the final approach fix; or~~

RNAV Proposed Rule

Sec. 135.225 IFR: Takeoff, approach and landing minimums.

~~(c) * * *~~

~~(1) On a precision or APV approach and has passed the precision final approach fix; or~~

EFVS Proposed Rule

Sec. 135.225 IFR: Takeoff, approach, and landing minimums.

~~(c) If a pilot has begun the final approach segment of an instrument approach to an airport under paragraph (b) of this section, and the pilot receives a later weather report indicating that conditions have worsened to below the minimum requirements, then the pilot may continue the approach only if the requirements of Sec. 91.175(l) of this chapter, or both of the following conditions, are met—~~

~~(1) The later weather report is received when the aircraft is in one of the following approach phases:~~

~~(i) The aircraft is on a precision or APV approach and has passed the precision final approach fix;~~

~~(ii) The aircraft is on an ASR or PAR final approach and has been turned over to the final approach controller; or~~

~~(iii) The aircraft is on a nonprecision final approach and the aircraft—~~

~~(A) Has passed the appropriate facility or final approach fix; or~~

~~(B) Where a final approach fix is not specified, has completed the procedure turn and is established inbound toward the airport on the final approach course within the distance prescribed in the procedure; and~~

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~~(2) On an ASR or PAR final approach and has been turned over to the final approach controller; or~~

~~(2) The pilot in command finds, on reaching the authorized MDA or DA/ DH, that the actual weather conditions are at or above the minimums prescribed for the procedure being used.~~

~~(3) On a final approach using a VOR, NDB, or comparable approach procedure; and the aircraft—~~

~~(3) On a nonprecision final approach; and the aircraft—~~

~~(i) Has passed the appropriate facility or final approach fix; or~~

~~(ii) Where a final approach fix is not specified, has completed the procedure turn and is established inbound toward the airport on the final approach course within the distance prescribed in the procedure; the approach may be continued and a landing made if the pilot finds, upon reaching the authorized MDA or DH, that actual weather conditions are at least equal to the minimums prescribed for the procedure.~~

~~(ii) Where a final approach fix is not specified, has completed the procedure turn and is established inbound toward the airport on the final approach course within the distance prescribed in the procedure. The approach may be continued, and a landing made, if the pilot finds, upon reaching the authorized MDA or DA/DH, that actual weather conditions are at or above the minimums prescribed for the procedure.~~

International Compatibility

In keeping with United States obligations under the Convention on International Civil Aviation, it is the FAA's policy to comply with International Civil Aviation Organization (ICAO) Standards and Recommended Practices to the maximum extent practicable. The FAA has determined that there are no ICAO Standards and Recommended Practices that corresponded to these proposed regulations.

[Comment: The above assertion that "... there are no ICAO Standards and Recommended Practices that correspond to these proposed regulations ..." is misleading, if not incorrect. Much of what is included in the EVS NPRM proposal is:

- ***in contradiction to the intent of ICAO Annex 6;***
- ***contrary to the intent of the ICAO Manual of All-Weather Operations (DOC 9365 AN/910);***
- ***in conflict with internationally recognized harmonization activity being accomplished through the FAA/JAA Harmonization Working Group;***
- ***in conflict with FAA's published criteria (recently industry and internationally revised FAA Advisory Circulars 120-28D and 120-29A, each produced by a nine year industry international harmonization effort), and***
- ***potentially contrary to safe air carrier operations.***

The statement in the NPRM would be true only if the proposal is significantly modified as noted in these comments, and as in our ENCLOSURE 3.]

Economic Evaluation

Proposed changes to regulations must undergo several economic analyses. First, Executive Order 12866 directs each Federal agency proposing or adopting a regulation to only upon a reasoned determination that the benefits of the intended regulation justify its costs. Second, the Regulatory Flexibility Act of 1980 requires agencies to analyze the economic impact of the regulatory changes on small entities. Third, the Trade Agreements Act (19 U.S.C. 2531-2533) prohibits agencies from setting standards that create unnecessary obstacles to the foreign commerce of the United States. In developing U.S. standards, the Trade Agreements Act requires agencies to consider international standards and, where appropriate, as the basis of U.S. standards. Fourth, the Unfunded Mandates Reform Act of 1995 (Pub.L. 104-4) requires agencies to prepare a written assessment of the costs, benefits, and other effects of proposed or final rules that include a Federal mandate likely to result in the expenditure by State, local, or tribal governments, in the aggregate, or by the private sector, of \$100 million or more annually (adjusted for inflation).

[Comment: Contrary to the assertion above, this NPRM as issued could create significant and unnecessary obstacles to the foreign commerce of the United States. Further, it appears to ignore the processes through which international standards are beneficially set, let alone endorse criteria set by those processes (e.g., it directly contradicts AWO harmonized criteria as referenced in FAA ACs 120-28D and 120-29A)].

In conducting these analyses, FAA has determined this rule: (1) Has benefits that justify its costs, is not a “significant regulatory action” as defined in section 3 (f) of Executive Order 12866, and is not “significant” as defined in DOT's Regulatory Policies and Procedures; (2) will not have a significant economic impact on a substantial number of small entities; (3) will not reduce barriers to international trade; and does not impose an unfunded mandate on state, local, or tribal governments, or on the private sector.

[Comment: Contrary to the assertion above, this NPRM as issued could create significant unnecessary cost obstacles for both operators and manufacturers of the United States by inappropriately and unfairly favoring technology that is not mature, may not work, and may not be safe, compared with other proven technologies. This situation has significant indirect competitive costs, design costs, liability costs, and aircraft operating penalty costs, which are not addressed by this NPRM].

However, for regulations with an expected minimal impact the above-specified analyses are not required. The Department of Transportation Order DOT 2100.5 prescribes policies and procedures for simplification, analysis, and review of regulations. If it is determined that the expected impact is so minimal that the proposal does not warrant a full evaluation, a statement to that effect and the basis for it is included in proposed regulation.

[Comment: The text above is incorrect. See our preceding comment. Even in the costs of assessing these kinds of technologies alone, many millions of dollars have already been spent by the U.S. Department of Defense, vendors, manufacturers, operators, and NASA, just to understand the potential benefits or adverse effects. Rules such as this can have a very significant effect on the directions such technology takes, with associated costs and liabilities.]

~~This rulemaking would allow, but does not require, operators to use an enhanced flight vision system on board their aircraft provided their pilots are properly trained. Therefore, this proposed rule would not impose any cost on any operator. As discussed above under “Discussion of the Proposal,” the FAA believes that this NPRM would provide operational benefits and improve the level of safety.~~

[Comment: The text above is incorrect. See our preceding comment.]

List of Subjects

~~14 CFR Part 1~~

~~—Air transportation.~~

~~14 CFR Part 91~~

~~Agriculture, Air traffic control, Aircraft, Airmen, Airports, Aviation safety, Canada, Freight, Mexico, Noise control, Political candidates.~~

~~14 CFR Part 121~~

~~—Air carriers, Aircraft, Airmen, Aviation safety, Charter flights, Safety, Transportation.~~

~~14 CFR Parts 125 and 135~~

~~—Aircraft, Airmen, Aviation safety.~~

The Proposed Amendment

~~—In consideration of the foregoing, the Federal Administration Aviation proposes to amend chapter I of 14 CFR as follows:~~

~~PART 1--DEFINITIONS AND ABBREVIATIONS~~

~~—1. The authority for part 1 continues to read as follows:~~

~~—Authority: 49 U.S.C. 106(g), 40113, 44701.~~

~~—2. Amend Sec. 1.1 by adding the following definitions in alphabetical order to read as follows:~~

~~Sec. 1.1 General definitions.~~

~~—Enhanced flight visibility means the average forward horizontal distance, from the cockpit of an aircraft in flight, at which prominent topographical objects may be clearly distinguished and identified by day or night by a pilot using an enhanced flight vision system.~~

~~—Enhanced flight vision system (EFVS) means an electronic means to provide a display of the forward external scene topography (natural or manmade features of a place or region especially in a way to show their relative positions and elevation) through the use of imaging sensors, such as a forward looking infrared, millimeter wave radiometry, millimeter wave radar, low light level image intensifying.~~

~~—Synthetic vision means a computer generated image of the external scene topography from the perspective of the flight deck that is derived from aircraft attitude, high precision navigation solution, and database of terrain, obstacles and relevant cultural features.~~

~~—Synthetic vision system means an electronic means to display a synthetic vision image of the external scene topography to the flight crew.~~

~~* * * * *~~

~~—3. Section 1.2 is amended by adding the following abbreviation in alphabetical order to read as follows:~~

~~Sec. 1.2 Abbreviations and symbols.~~

~~* * * * *~~

~~—EFVS means enhanced flight vision system~~

~~* * * * *~~

PART 91--GENERAL OPERATING AND FLIGHT RULES

4. The authority citation for part 91 continues to read as follows:

Authority: 49 U.S.C. 106(g), 1155, 40103, 40113, 40120, 44101, 44111, 44701, 44709, 44711, 44712, 44715, 44716, 44717, 44722, 46306, 46315, 46316, 46504, 46506-46507, 47122, 47508, 47528-47531, articles 12 and 29 of the Convention on International Civil Aviation (61 Stat. 1180).

5. Amend Sec. 91.175 by revising paragraphs **(a) through (l)** ~~(c) introductory text, as proposed at 67 FR 77341; Dec. 17, 2002, (d), and (e)(1) introductory text, and by adding paragraphs (l) and (m) to read as follows:~~

Sec. 91.175 Takeoff and landing under IFR.

- (a) Instrument approaches to civil airports. Unless otherwise authorized by the Administrator, when an instrument letdown to a civil airport is necessary, each person operating an aircraft, except a military aircraft of the United States, shall use a standard instrument approach procedure prescribed for the airport in part 97 of this chapter.**
- (b) Authorized DA(H) or MDA(H). For the purpose of this section, when the approach procedure being used provides for and requires the use of a DA(H) or MDA(H), the authorized DA(H) or MDA(H) is the highest of the following:**
 - (1) The DA(H) or MDA(H) prescribed by the approach procedure.**
 - (2) The DA(H) or MDA(H) prescribed for the pilot in command.**
 - (3) The DA(H) or MDA(H) for which the aircraft is equipped.**
- (c) Operation below DA(H) or MDA(H). Where a DA(H) or MDA(H) is applicable, no pilot may operate an aircraft, except a military aircraft of the United States, at any airport below the authorized MDA(H) or continue an approach below the authorized DA(H) unless -**
 - (1) The aircraft is continuously in a position from which a descent to a landing on the intended runway can be made at a normal rate of descent using normal maneuvers, and for operations conducted under part 121 or part 135 unless that descent rate will allow touchdown to occur within the touchdown zone of the runway of intended landing;**
 - (2) The flight visibility is not less than the visibility prescribed in the standard instrument approach being used; and**
 - (3) Except for a Category II or Category III approach where any necessary visual reference requirements are specified by the Administrator, at least one of the following visual references for the intended runway is distinctly visible and identifiable to the pilot:**

- (i) The approach light system.*
 - (ii) The threshold.*
 - (iii) The threshold markings.*
 - (iv) The threshold lights.*
 - (v) The runway end identifier lights.*
 - (vi) The visual approach slope indicator.*
 - (vii) The touchdown zone or touchdown zone markings.*
 - (viii) The touchdown zone lights.*
 - (ix) The runway or runway markings.*
 - (x) The runway lights.*
- (d) Landing. No pilot operating an aircraft, except a military aircraft of the United States, may land that aircraft when the flight visibility is less than the visibility prescribed in the standard instrument approach procedure being used.*
- (e) Missed approach procedures. Each pilot operating an aircraft, except a military aircraft of the United States, shall immediately execute an appropriate missed approach procedure when either of the following conditions exist:*
 - (1) Whenever the requirements of paragraph (c) of this section are not met at either of the following times:*
 - (i) When the aircraft is being operated below MDA(H); or*
 - (ii) Upon arrival at the missed approach point, including a DA(H) where a DA(H) is specified and its use is required, and at any time after that until touchdown.*
 - (2) Whenever an identifiable part of the airport is not distinctly visible to the pilot during a circling maneuver at or above MDA(H), unless the inability to see an identifiable part of the airport results only from a normal bank of the aircraft during the circling approach.*
- (f) Civil airport takeoff minimums. Unless otherwise authorized by the Administrator, no pilot operating an aircraft under parts 121, 125, 127, 129, or 135 of this chapter may takeoff from a civil airport under IFR unless weather conditions are at or above the weather minimum for IFR takeoff prescribed for that airport under part 97 of this chapter. If takeoff minimums are not prescribed under part 97 of this chapter for a particular airport, IFR takeoff minima for aircraft operating under those parts are 1/2 statute mile visibility.*

(g) Military airports. Unless otherwise prescribed by the Administrator, each person operating a civil aircraft under IFR into or out of a military airport shall comply with the instrument approach procedures and the takeoff and landing minimum prescribed by the military authority having jurisdiction of that airport.

(h) Comparable values of RVR and ground visibility.

(1) Except for Category II or Category III minimums, if RVR minimums for takeoff or landing are prescribed in an instrument approach procedure, but RVR is not reported for the runway of intended operation, the RVR minimum shall be converted to ground visibility in accordance with approved Operations Specifications for that operator, if Operations Specifications are applicable, or in accordance with the following table.

RVR (feet)	Visibility (statute miles)
1,600	1/4
2,400	1/2
3,200	5/8
4,000	3/4
4,500	7/8
5,000	1
6,000	1 1/4

(i) Operations on unpublished routes and use of radar in instrument approach procedures. When radar is approved at certain locations for ATC purposes, it may be used not only for surveillance and precision radar approaches, as applicable, but also may be used in conjunction with instrument approach procedures predicated on other types of radio navigational aids. Radar vectors may be authorized to provide course guidance through the segments of an approach to the final course or fix. When operating on an unpublished route or while being radar vectored, the pilot, when an approach clearance is received, shall, in addition to complying with § 91.177, maintain the last altitude assigned to that pilot until the aircraft is established on a segment of a published route or instrument approach procedure unless a different altitude is assigned by ATC. After the aircraft is so established, published altitudes apply to descent within each succeeding route or approach segment unless a different altitude is assigned by ATC. Upon reaching the final approach course or fix, the pilot may either complete the instrument

approach in accordance with a procedure approved for the facility or continue a surveillance or precision radar approach to a landing.

- (j) Limitation on procedure turns. In the case of a radar vector to a final approach course or fix, a timed approach from a holding fix, or an approach for which the procedure specifies "No PT," no pilot may make a procedure turn unless cleared to do so by ATC.***
- (k) Instrument Procedure Component substitution. Fixes, components, or navigation methods may be substituted in an instrument approach procedure as noted by that instrument procedure, as noted by Operations Specifications, or as otherwise authorized by the administrator. If not otherwise restricted or limited, a compass locator or precision radar may be substituted for the outer or middle marker. RNAV, DME, VOR, or nondirectional beacon fixes authorized in the standard instrument approach procedure or surveillance radar may be substituted for the outer marker. Applicability of, and substitution for an inner marker for Category II or III approaches is determined by the appropriate part 97 approach procedure, letter of authorization, or operations specification pertinent to the operations.***
- (l) Notwithstanding provisions of paragraphs c(2), (d), and (e) above, the Administrator may approve use of systems and procedures meeting requirements other than those specified, if:***
- (1) The systems and procedures proposed are shown to have equivalent or better performance than other approved systems, are operationally safe, effective, and reliable for approach, landing, missed approach, or takeoff, as applicable, and,***
- (2) If visual reference requirements apply, the pilot is able to determine that flight visibility is adequate for safe takeoff or landing.***

~~*****~~

~~——(c) Operation below DA, DH or MDA. Except as provided in paragraph (l) of this section, where a DA, DH, or MDA is applicable, no pilot may operate an aircraft, except a military aircraft of the United States, at any airport below the authorized MDA or continue an approach below the authorized DA/DH unless——~~

~~*****~~

~~——(d) Landing. No pilot operating an aircraft, except a military aircraft of the United States, may land that aircraft when——~~

~~——(1) For operations conducted under paragraph (l) of this section, the requirements of paragraph (l)(4) of this section are not met; or~~

~~——(2) For all other part 91 operations and parts 121, 125, 129, and 135 operations, the flight visibility is less than the visibility prescribed in the standard instrument approach procedure being used.~~

~~——(e) ***~~

~~——(1) Whenever operating an aircraft pursuant to paragraph (c) or (l) of this section and the requirements of that paragraph are not met at either of the following times:~~

~~*****~~

~~—— (l) Approach to straight in landing operations below DA, DH, or MDA using an enhanced flight vision system (EFVS). No pilot operating under this section or Sec. 121.651, 125.381, and 135.225 of this chapter may operate an aircraft at any airport below the authorized MDA or continue an approach below the authorized DA or DH and land unless—~~

~~—— (1) The aircraft is continuously in a position from which a descent to a landing on the intended runway can be made at a normal rate of descent using normal maneuvers, and, for operations conducted under part 121 or part 135 of this chapter, the descent rate will allow touchdown to occur within the touchdown zone of the runway of intended landing;~~

~~—— (2) The pilot determines that the enhanced flight visibility observed by use of a certified enhanced flight vision system is not less than the visibility prescribed in the standard instrument approach procedure being used;~~

~~—— (3) The following visual references for the intended runway are distinctly visible and identifiable to the pilot using the enhanced flight vision system:~~

~~—— (i) The approach light system (if installed); or~~

~~—— (ii) The runway threshold and the touchdown zone;~~

~~—— (4) At 100 feet above the touchdown zone elevation of the runway of intended landing and below that altitude, the flight visibility must be sufficient for the following to be distinctly visible and identifiable to the pilot without reliance on the enhanced flight vision system to continue to a landing:~~

~~—— (i) The lights or markings of the threshold; or~~

~~—— (ii) The lights or markings of the touchdown zone;~~

~~—— (5) The pilot(s) is qualified to use an EFVS as follows—~~

~~—— (i) For parts 119 and 125 certificate holders, the applicable training, testing and qualification provisions of parts 121, 125, and 135 of this chapter;~~

~~—— (ii) For foreign persons, in accordance with the requirements of the civil aviation authority of the State of the operator; or~~

~~—— (iii) For persons conducting any other operation, in accordance with the applicable qualification and proficiency requirements of part 61 of this chapter and the operating limitations specified in the approved Airplane or Rotorcraft Flight Manual;~~

~~—— (6) For parts 119 and 125 certificate holders, and part 129 operations specifications holders, their operations specifications authorize use of EFVS; and~~

~~—— (7) The aircraft is equipped with, and the pilot uses, an enhanced flight vision system, the display of which is suitable for maneuvering the aircraft and has either an FAA type design approval or, for a foreign-registered aircraft, the EFVS is of a type design approved by the United States and complies with all of the requirements of this chapter that would be applicable to that aircraft were it registered in the United States, including the requirements for a U.S. standard airworthiness certificate.~~

~~—— (m) For purposes of this section, “enhanced flight vision system” (EFVS) is an installed airborne system comprised of the following features and characteristics:~~

~~—— (1) An electronic means to provide a display of the forward external scene topography (natural or manmade features of a place or region especially in a way to show their relative positions and elevation) through the use of imaging sensors, such as a forward-looking infrared, millimeter wave radiometry, millimeter wave radar, and low light level image intensifying;~~

~~—— (2) The EFVS sensor imagery and aircraft flight symbology (i.e. at least airspeed, vertical speed, aircraft attitude, heading, altitude) are presented on a head-up display so that they are clearly visible to the pilot flying in his or her normal position and line of vision and looking forward along the flight path;~~

- ~~———— (3) The displayed imagery and aircraft flight symbology does not adversely obscure the pilot's outside view or field of view through the cockpit window;~~
~~———— (4) The EFVS includes the display element, sensors, computers and power supplies, indications, and controls. It may receive inputs from an airborne navigation system or flight guidance system; and~~
~~———— (5) The display characteristics and dynamics are suitable for manual control of the aircraft.~~

**~~PART 121—OPERATING REQUIREMENTS: DOMESTIC FLAG, AND
SUPPLEMENTAL OPERATIONS~~**

- ~~———— 6. The authority citation for part 121 continues to read as follows:~~

~~———— Authority: 49 U.S.C. 106(g), 40113, 40119, 41706, 44101, 44701-44702, 44705, 44709-44711, 44713, 44716-44717, 44722, 44901, 44903-44904, 44912, 46105.~~

- ~~———— 7. Amend Sec. 121.651 by revising paragraphs (c) introductory text and (d) introductory text, as proposed at 67 FR 77345; Dec. 17, 2002, to read as follows:~~

~~Sec. 121.651 Takeoff and landing weather minimums: IFR: All certificate holders.~~

~~* * * * *~~

~~———— (c) If a pilot has begun the final approach segment of an instrument approach procedure in accordance with paragraph (b) of this section, and after **[[Page 6813]]** that receives a later weather report indicating below minimum conditions, the pilot may continue the approach to DA/DH or MDA. Upon reaching DA/DH, or at MDA, and at any time before the missed approach point, the pilot may continue the approach below DA/DH or MDA if either the requirements of Sec. 91.175(l) of this chapter, or the following requirements are met:~~

~~* * * * *~~

~~———— (d) A pilot may begin the final approach segment of a Category I precision approach procedure at an airport when the visibility is less than the visibility minimums prescribed for that procedure if that airport is served by an operative PAR and another operative precision instrument approach system, and both the PAR and the precision approach are used by the pilot. However, no person may continue an approach below the authorized DA unless the requirements of Sec. 91.175(l) of this chapter, or the following requirements are met:~~

~~* * * * *~~

**~~PART 125—CERTIFICATION AND OPERATIONS: AIRPLANES HAVING A
SEATING CAPACITY OF 20 OR MORE PASSENGERS OR A MAXIMUM PAYLOAD
CAPACITY OF 6,000 POUNDS OR MORE; AND RULES GOVERNING PERSONS
ON BOARD SUCH AIRCRAFT~~**

- ~~———— 8. The authority citation for part 125 continues to read as follows:~~

~~———— Authority: 49 U.S.C. 106(g), 40113, 44701-44702, 44705, 44710-44711, 44713, 44716-44717, 44722.~~

~~9. Amend Sec. 125.381 by revising paragraph (c), as proposed at 67 FR 77346; Dec. 17, 2002, to read as follows:~~

~~Sec. 125.381 Takeoff and landing weather minimums: IFR.~~

~~* * * * *~~

~~(c) If a pilot initiates an instrument approach procedure based on a weather report that indicates that the specified visibility minimums exist and subsequently receives another weather report that indicates that conditions are below the minimum requirements, then the pilot may continue with the approach only if, the requirements of Sec. 91.175(l) of this chapter, or both of the following conditions are met—~~

~~(1) The later weather report is received when the airplane is in one of the following approach phases:~~

~~(i) The airplane is on a precision or APV approach and has passed the precision final approach fix;~~

~~(ii) The airplane is on an ASR or PAR final approach and has been turned over to the final approach controller; or~~

~~(iii) The airplane is on a nonprecision final approach and the airplane—~~

~~(A) Has passed the appropriate facility or final approach fix; or~~

~~(B) Where a final approach fix is not specified, has completed the procedure turn and is established inbound toward the airport on the final approach course within the distance prescribed in the procedure; and~~

~~(2) The pilot in command finds, on reaching the authorized MDA, or DA/DH, that the actual weather conditions are at or above the minimums prescribed for the procedure being used.~~

~~* * * * *~~

~~PART 135—OPERATING REQUIREMENTS: COMMUTER AND ON-DEMAND OPERATIONS~~

~~10. The authority citation for part 135 continues to read as follows:~~

~~Authority: 49 U.S.C. 106(g), 44113, 44701–44702, 44705, 44709, 44711–44713, 44715–44717, 44722.~~

~~11. Amend Sec. 135.225 by revising paragraph (c), as proposed at 67 FR 77348, Dec. 17, 2002, to read as follows:~~

~~Sec. 135.225 IFR: Takeoff, approach, and landing minimums.~~

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~~(c) If a pilot has begun the final approach segment of an instrument approach to an airport under paragraph (b) of this section, and the pilot receives a later weather report indicating that conditions have worsened to below the minimum requirements, then the pilot may continue the approach only if the requirements of Sec. 91.175(l) of this chapter, or both of the following conditions, are met—~~

~~(1) The later weather report is received when the aircraft is in one of the following approach phases:~~

~~———— (i) The aircraft is on a precision or APV approach and has passed the precision final approach fix;~~
~~———— (ii) The aircraft is on an ASR or PAR final approach and has been turned over to the final approach controller; or~~
~~———— (iii) The aircraft is on a nonprecision final approach and the aircraft—~~
~~———— (A) Has passed the appropriate facility or final approach fix; or — (B) Where a final approach fix is not specified, has completed the procedure turn and is established inbound toward the airport on the final approach course within the distance prescribed in the procedure; and~~
~~———— (2) The pilot in command finds, on reaching the authorized MDA or DA/DH, that the actual weather conditions are at or above the minimums prescribed for the procedure being used.~~

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ENCLOSURE 3

Boeing Commercial Airplanes Comments on Docket FAA-2003-14449, NPRM Notice No. 03-03, “Enhanced Flight Vision Systems”

RECOMMENDED REVISED PROVISIONS FOR 14 CFR §91.175

§91.175 Takeoff and landing under IFR.

- (a) Instrument approaches to civil airports. Unless otherwise authorized by the Administrator, when an instrument letdown to a civil airport is necessary, each person operating an aircraft, except a military aircraft of the United States, shall use a standard instrument approach procedure prescribed for the airport in part 97 of this chapter.
- (b) Authorized DA(H) or MDA(H). For the purpose of this section, when the approach procedure being used provides for and requires the use of a DA(H) or MDA(H), the authorized DA(H) or MDA(H) is the highest of the following:
 - (1) The DA(H) or MDA(H) prescribed by the approach procedure.
 - (2) The DA(H) or MDA(H) prescribed for the pilot in command.
 - (3) The DA(H) or MDA(H) for which the aircraft is equipped.
- (c) Operation below DA(H) or MDA(H). Where a DA(H) or MDA(H) is applicable, no pilot may operate an aircraft, except a military aircraft of the United States, at any airport below the authorized MDA(H) or continue an approach below the authorized DA(H) unless --
 - (1) The aircraft is continuously in a position from which a descent to a landing on the intended runway can be made at a normal rate of descent using normal maneuvers, and for operations conducted under part 121 or part 135 unless that descent rate will allow touchdown to occur within the touchdown zone of the runway of intended landing;
 - (2) The flight visibility is not less than the visibility prescribed in the standard instrument approach being used; and
 - (3) Except for a Category II or Category III approach where any necessary visual reference requirements are specified by the Administrator, at least one of the following visual references for the intended runway is distinctly visible and identifiable to the pilot:
 - (i) The approach light system.
 - (ii) The threshold.

- (iii) The threshold markings.
 - (iv) The threshold lights.
 - (v) The runway end identifier lights.
 - (vi) The visual approach slope indicator.
 - (vii) The touchdown zone or touchdown zone markings.
 - (viii) The touchdown zone lights.
 - (ix) The runway or runway markings.
 - (x) The runway lights.
- (d) Landing. No pilot operating an aircraft, except a military aircraft of the United States, may land that aircraft when the flight visibility is less than the visibility prescribed in the standard instrument approach procedure being used.
- (e) Missed approach procedures. Each pilot operating an aircraft, except a military aircraft of the United States, shall immediately execute an appropriate missed approach procedure when either of the following conditions exist:
- (1) Whenever the requirements of paragraph (c) of this section are not met at either of the following times:
 - (i) When the aircraft is being operated below MDA(H); or
 - (ii) Upon arrival at the missed approach point, including a DA(H) where a DA(H) is specified and its use is required, and at any time after that until touchdown.
 - (2) Whenever an identifiable part of the airport is not distinctly visible to the pilot during a circling maneuver at or above MDA(H), unless the inability to see an identifiable part of the airport results only from a normal bank of the aircraft during the circling approach.
- (f) Civil airport takeoff minimums. Unless otherwise authorized by the Administrator, no pilot operating an aircraft under parts 121, 125, 127, 129, or 135 of this chapter may takeoff from a civil airport under IFR unless weather conditions are at or above the weather minimum for IFR takeoff prescribed for that airport under part 97 of this chapter. If takeoff minimums are not prescribed under part 97 of this chapter for a particular airport, IFR takeoff minima for aircraft operating under those parts are 1/2 statute mile visibility.
- (g) Military airports. Unless otherwise prescribed by the Administrator, each person operating a civil aircraft under IFR into or out of a military airport shall comply with the instrument approach procedures and the takeoff and landing minimum prescribed by the military authority having jurisdiction of that airport.

(h) Comparable values of RVR and ground visibility.

- (1) Except for Category II or Category III minimums, if RVR minimums for takeoff or landing are prescribed in an instrument approach procedure, but RVR is not reported for the runway of intended operation, the RVR minimum shall be converted to ground visibility in accordance with approved Operations Specifications for that operator, if Operations Specifications are applicable, or in accordance with the following table.

RVR (feet)	Visibility (statute miles)
1,600	1/4
2,400	1/2
3,200	5/8
4,000	3/4
4,500	7/8
5,000	1
6,000	1 1/4

- (i) Operations on unpublished routes and use of radar in instrument approach procedures. When radar is approved at certain locations for ATC purposes, it may be used not only for surveillance and precision radar approaches, as applicable, but also may be used in conjunction with instrument approach procedures predicated on other types of radio navigational aids. Radar vectors may be authorized to provide course guidance through the segments of an approach to the final course or fix. When operating on an unpublished route or while being radar vectored, the pilot, when an approach clearance is received, shall, in addition to complying with §91.177, maintain the last altitude assigned to that pilot until the aircraft is established on a segment of a published route or instrument approach procedure unless a different altitude is assigned by ATC. After the aircraft is so established, published altitudes apply to descent within each succeeding route or approach segment unless a different altitude is assigned by ATC. Upon reaching the final approach course or fix, the pilot may either complete the instrument approach in accordance with a procedure approved for the facility or continue a surveillance or precision radar approach to a landing.
- (j) Limitation on procedure turns. In the case of a radar vector to a final approach course or fix, a timed approach from a holding fix, or an approach for which the procedure specifies "No PT," no pilot may make a procedure turn unless cleared to do so by ATC.

- (k) Instrument Procedure Component Substitution. Fixes, components, or navigation methods may be substituted in an instrument approach procedure as noted by that instrument procedure, as noted by Operations Specifications, or as otherwise authorized by the administrator. If not otherwise restricted or limited, a compass locator or precision radar may be substituted for the outer or middle marker. RNAV, DME, VOR, or nondirectional beacon fixes authorized in the standard instrument approach procedure or surveillance radar may be substituted for the outer marker. Applicability of, and substitution for an inner marker for Category II or III approaches is determined by the appropriate part 97 approach procedure, letter of authorization, or operations specification pertinent to the operations.
- (l) Notwithstanding provisions of paragraphs c(2), (d), and (e) above, the Administrator may approve use of systems and procedures meeting requirements other than those specified, if:
 - (1) The systems and procedures proposed are shown to have equivalent or better performance than other approved systems, are operationally safe, effective, and reliable for approach, landing, missed approach, or takeoff, as applicable, and,
 - (2) If visual reference requirements apply, the pilot is able to determine that flight visibility is adequate for safe takeoff or landing.